

We claim:

1 1. A machine readable medium that provides instructions, which when executed by a
2 set of processors, cause said set of processors to perform operations comprising:
3 receiving an Ethernet frame; and
4 transmitting the Ethernet frame over a non-homogenous tunnel, the tunnel
5 distinguishing subscriber traffic.

1 2. The machine readable medium of claim 1 further comprising transmitting
2 requested values over the non-homogenous tunnel.

1 3. The machine readable medium of claim 1 wherein the Ethernet frame is
2 transmitted on one of the plurality of sessions.

1 4. A machine readable medium that provides instructions, which when executed by a
2 set of processors, cause said set of processors to perform operations comprising:
3 transmitting a set of Ethernet data included in an Ethernet frame with Layer 2
4 Tunneling Protocol (L2TP); and
5 transmitting the set of Ethernet data to a service provider.

1 5. The machine readable medium of claim 4 further comprising the service provider
2 analyzing the set of Ethernet data.

1 6. The machine readable medium of claim 4 wherein the set of Ethernet data is
2 transmitted over a non-homogenous L2TP tunnel.

1 7. The machine readable medium of claim 4 wherein the transmitting the set of
2 Ethernet data comprises encapsulating the Ethernet frame with L2TP.

1 8. The machine readable medium of claim 7 wherein the encapsulating the Ethernet
2 frame comprises:

3 establishing an L2TP tunnel capable of carrying the Ethernet frame;
4 establishing an L2TP session for carrying the Ethernet frame; and
5 prepending L2TP headers onto the Ethernet frame.

1 9. A machine readable medium that provides instructions, which when executed by a
2 set of processors, cause said set of processors to perform operations comprising:

3 encapsulating an Ethernet frame in Layer 2 Tunneling Protocol (L2TP); and
4 transmitting the L2TP encapsulated Ethernet frame over a network; and
5 decapsulating the Ethernet frame from L2TP.

1 10. The machine readable medium of claim 9 wherein the L2TP encapsulated
2 Ethernet frame is transmitted on one of a plurality of sessions of a non-homogenous
3 tunnel.

1 11. The machine readable medium of claim 9 wherein transmitting the Ethernet frame
2 further comprises transmitting attribute value pairs (AVPs) in relation to the Ethernet
3 frame.

1 12. The machine readable medium of claim 9 wherein transmitting the frame
2 comprises:

3 establishing an Ethernet capable L2TP tunnel; and
4 establishing an L2TP session to carry the frame; and
5 transmitting a MAC address.

receiving a session control message having an AVP indicating a session type and an Ethernet MAC address;

creating a virtual circuit structure for the session type in response to the session control message; and

processing an L2TP packet having a payload with the virtual circuit structure.

29. The machine readable medium of claim 28 wherein processing the L2TP packet comprises:

decapsulating the payload from the L2TP packet; and

processing the payload as indicated by the virtual circuit structure.

30. The machine readable medium of claim 28 wherein the first and second control messages include values requested by a customer.

31. An apparatus comprising:
 - a Layer 2 Tunneling Protocol (L2TP) Access Concentrator (LAC) to transmit an Ethernet frame over an L2TP tunnel; and
 - an Layer 2 Tunneling Protocol Network Server (LNS) to receive the Ethernet frame from the L2TP tunnel originating at the LAC.

32. The machine readable medium of claim 31 wherein the L2TP tunnel is non-homogenous.

33. The apparatus of claim 31 wherein the LAC to transmit the Ethernet frame comprises:

establishing an L2TP tunnel capable of carrying an Ethernet over L2TP session;

and

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5 establishing an Ethernet over L2TP session to the LNS.

1 34. The apparatus of claim 33 wherein establishing an L2TP tunnel capable of
2 carrying an Ethernet over L2TP session comprises:
3 the LAC transmitting a first tunnel control message to the LNS indicating
4 Ethernet frame capability; and
5 the LNS transmitting a second tunnel control message to the LAC indicating
6 Ethernet frame capability.

1 35. The apparatus of claim 33 wherein the establishing the Ethernet over L2TP
2 session to the LNS comprises the LAC transmitting to the LNS a session control message
3 indicating Ethernet encapsulation and an Ethernet Media Access Control (MAC) address
4 for the LAC.

1 36. A Layer 2 Tunneling Protocol (L2TP) Access Concentrator (LAC) comprising:
2 an operating system to establish an Ethernet capable L2TP tunnel with a peer,
3 to perform session fail retry;
4 to establish an Ethernet over L2TP session in the tunnel,
5 to encapsulate an Ethernet frame with L2TP; and
6 a circuit to transmit the session.

1 37. The LAC of claim 36 wherein to establish the Ethernet over L2TP session
2 comprises transmitting signals, the signals including requested values.

1 38. The LAC of claim 36 wherein the tunnel is non-homogenous.

1 45. A computer implemented method comprising:
 2 receiving an Ethernet frame; and
 3 transmitting the Ethernet frame over a non-homogenous tunnel, the tunnel having
 4 a plurality of sessions.

1 46. The method of claim 45 further comprising transmitting requested values over the
 2 non-homogenous tunnel.

1 47. The method of claim 45 wherein the Ethernet frame is transmitted on one of the
 2 plurality of sessions.

1 48. A computer implemented method comprising:
 2 transmitting a first tunnel control message for Layer 2 Tunneling Protocol (L2TP)
 3 tunnel setup having
 4 an attribute value pair (AVP) indicating Ethernet frame capability,
 5 receiving a second tunnel control message for L2TP tunnel setup having
 6 an AVP indicating Ethernet frame capability;
 7 transmitting a session control message having an AVP indicating an L2TP
 8 Ethernet session and an Ethernet Media Access Control (MAC) address;
 9 and
 10 transmitting an Ethernet frame with the L2TP Ethernet session.

1 49. The method of claim 48 further comprising performing AAA retry before
 2 transmitting the Ethernet frame.

- 1 50. The method of claim 48 wherein transmitting the first and second tunnel control
- 2 messages comprises manipulating the bits of the first and second tunnel control
- 3 messages.